DETERMINATION OF LEAD CONTENT IN WHITENING CREAM USING LASER INDUCED BREAKDOWN SPECTROSCOPY ANALYSIS

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DEDICATION

"I humbly thank Allah Almighty, the Merciful and the Beneficent, who gave me health, thoughts and co-operative people to enable me achieve this goal."

To My Dearest Husband

Mohd Azahar b Che Abdullah

Thank you so much for your love and motivation

To My Beloved Parents,

W. Mohd Shukri b W. Ibrahim & Huzian bt Husin

Thank you very much for your love and supports

To My Lovely Siblings

W. Muhammad Syafiq b W. Mohd Shukri

W. Syazwan b W. Mohd Shukri

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Prof. Dr. Noriah Ibrahim

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And all my friends…

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ABSTRACT

Laser Induced Breakdown Spectroscopy (LIBS) technique was applied to determine the concentration of heavy metal such as Pb in five different whitening creams available from retail shop and open market in Johor, Malaysia. The whitening cream in the form of an emulsion was painted on the glass slide and then cryogenically frozen in refrigerator. The harden sample of whitening creams were irradiated with light Q-switch Nd:YAG laser at five different positions on the same sample. The spectral lines of six whitening creams were identified using National Institute of Standards and Technology (NIST) Database. Finally, Pb was detected in all the studied samples and their concentration in the range of 1.78 ppm – 4.64 ppm with limit of detection which is ~ 1 ppm. The LIBS results were validated by Inductive Couple Plasma Mass Spectroscopy (ICP-MS) technique with percentage difference in the range of 2.73% – 7.60%. The detection of Pb in the whitening creams is under permissible limit as set by Malaysian standard. However, the limitation is over as set by WHO which is 0.05 ppm for daily used. Thus, it is better to take precaution because continuously using creams may lead to accumulative toxicity in the body beyond the acceptable limit. Thus, the high sensitivity, portable and *in-situ* system allow LIBS to be an important technique in cosmetic industries.

ABSTRAK

Teknik spektroskopi leraian aruhan laser (LIBS) telah digunakan untuk menentukan kepekatan logam berat Pb di dalam enam jenis krim pemutih yang berbeza yang boleh didapati dari kedai runcit dan pasaraya di Malaysia. Krim pemutih adalah dalam bentuk emulsi telah dicat pada kepingan kaca dan kemudian dibekukan dalam peti sejuk. Sampel krim yang telah dikeraskan kemudian diradiasikan dengan cahaya laser suis-Q Nd : YAG di lima kedudukan yang berbeza pada tempat sasaran yang sama. Spektrum bagi enam jenis krim pemutih telah dikenal pasti dengan menggunakan data dari Institut Piawaian dan Teknologi Kebangsaan (NIST). Akhir sekali, Pb dikesan dalam semua sampel yang telah dikaji dengan kepekatan dalam lingkungan 1.78 pm – 4.64 ppm dengan had pengesanan ialah ~ 1 ppm. Keputusan LIBS telah disahkan oleh teknik plasma berganding aruhan spektrometri jisim (ICP-MS) dengan perbezaan peratus dalam lingkungan 2.73% – 7.60%. Pb yang dikesan dalam semua krim pemutih adalah di bawah had yang dibenarkan seperti yang telah ditetapkan oleh Piawaian Malaysia. Walau bagaimanapun, had ini adalah berlebihan seperti yang telah ditetapkan oleh WHO iaitu 0.05 ppm untuk kegunaan harian. Oleh itu, adalah lebih baik untuk mengambil langkah berjaga-jaga kerana penggunaan krim ini yang berterusan boleh menyebabkan pengumpulan toksik di dalam badan melebihi had yang boleh diterima. Oleh itu, kepekaan yang tinggi, mudah alih dan sistem *in-situ* membolehkan LIBS sebagai teknik penting dalam industri kosmetik.